OSCAR Satellite Report & Satellite Operator

Special Report
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What Happened in Early 1991?

If you haven't subscribed to *OSCAR Satellite Report*, you've missed some of the most important stories of the last six months. More importantly, you've missed them at the time when they happened! And if you haven't added *Satellite Operator* to your reading list, you've missed even more!

Here we bring you up to date information on the Phase 3D and other programs by presenting articles which topped the news so far in 1991. Then we have some DX news. On page 4, we'll give you a set of current satellite Keplerian Elements to get your tracking programs back into shape, in case you've had an "interest lapse" and want to get a "jump-start" back into the Satellite Program. On the reverse side of the order form we have a status report of all the current satellite programs. The Phase 3D Program is under full swing with complete minutes of the last meeting in Marburg, Germany appearing in the upcoming July issue of *Satellite Operator*. Interesting reading! And very important to our future.

We hope you'll continue to support your Satellite Program and subscribe to one (or both!) of these newsletters. — *W1XT*

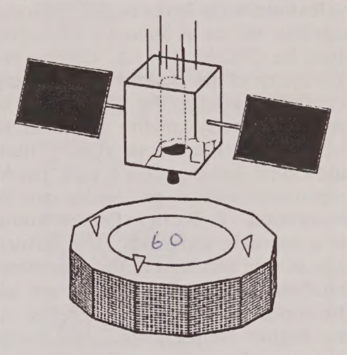
Transponder Choices for the P3D Satellite

By Werner Haas, DJ5KQ

The following article originally appeared in the *AMSAT-DL Journal* for March/May 1991 and more recently in *Satellite Operator*. It was translated from German to English (with our thanks!) by Don Moe, DJ0HC/KE6MN.

During the past several months there has been considerable discussion about which transponders should be included in the new P3D satellite. A large group has expressed the opinion that Mode B (Input 70cm/Output 2m) should no longer be used due to the expected hopeless overcrowding of the 2 meter satellite band prior to the launch in 1995. Another group argues that a large number of stations are already active in Mode B and furthermore, it requires less expense and effort for a satellite beginner to become active on Mode B.

Without question, Mode L (Input 23cm/Output 70cm) is the more elegant operational mode, but it does require more technical capability on the part of the user on the ground. The 100 Watt 23cm transmitter along with the corresponding transmitting antenna represents an excessive investment for many. For this reason, Mode L is not nearly as popular as Mode B.



When considering the various "pro" and "con" aspects, we should not forget however, that the new P3D satellite will be launched in four to five years from now, and with a life expectancy of 10 years, it will be usable well into the next century. Technological development is progressing with giant strides, and the equipment and antennas now costing a fortune will be quite affordable in just a few years. We recall quite well the response to our suggestion for OSCAR 7 that Mode B be used as an alternative to Mode A. At that time we received a flood of angry letters and insults since we "dared" to replace the popular Mode A with a more modern operating mode. You all know the outcome. Mode B, which was so strongly scorned at that time, has since become the favorite mode of the satellite users.

While doing some extensive planning for the future, we can also imagine that a transponder for P3D could have an input on 70cm (like Mode B), the output however on 23cm or 13cm. Although 23cm is currently not allowed for satellite downlinks, the necessary steps to remove this restriction could be made at the appropriate time.

Loud cries of indignation are already ringing in our ears. However, if the requirements of such a ground station are simply considered, it is apparent that this operating mode requires less expense than for Mode B. The transmitter and transmitting antenna on 70cm remain as for Mode B. Only the transmitting power will be less since the links to and from the satellite will be at least 10 dB better than for OSCAR 10/13. On the receiver side of the ground station, only a simple converter for 23 or 13cm is needed directly at the antenna to convert down to 2m or 10m. Thus, additional preamplifiers and thick, expensive cable in particular can be eliminated. A 60cm reflector would be a suitable antenna. The advantage of this solution is the increased bandwidth available and above all the complete lack of interference on the higher frequencies. We Radio Amateurs have the duty to develop new, future-oriented technologies and operating modes and to defend our rights to our frequency allocations.

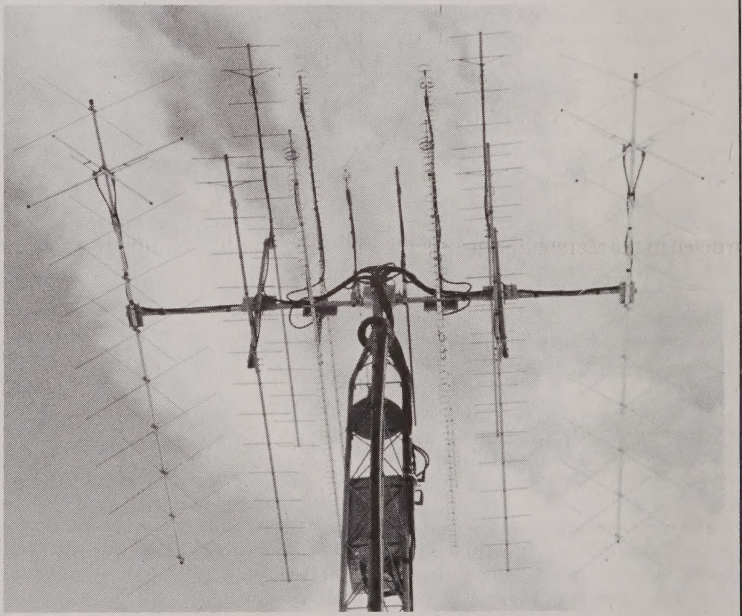
In order to be fair to all interests, we have analyzed an idea based on the following thought: the P3D satellite would be equipped with a receiver module for every possible uplink frequency and a transmit module for every possible downlink frequency, including the higher ranges up to 10 GHz. This would allow nearly any operating mode to be selected remotely, thus assuring that the needs in the coming years could be readily accommodated. Furthermore, this would avoid hasty decisions now that could not be corrected later. P3D will of course have not only an analog, but also a digital transponder, such as RUDAK-III. The idea just described would also apply to this operating mode.

Editor's Note: Send us your suggestions about the Phase 3D Satellite Project and what capabilities you think it should have. We'll send a copy of your letter to both AMSAT-DL and AMSAT-NA well before the next P3D Project Planning Meeting, now scheduled to be held in Orlando just a few days before the AMSAT-NA 1991 Space Symposium in November. As space allows, we'll also print your letter in the pages of Satellite Operator. What frequency combinations will make the most sense (present regulations aside) in 1995? There could be a great variety of modes available under the matrix approach to transponders described by DJ5KQ. How should satellite planners determine what is fair for the majority of users when it comes to the percentage of time available for each mode? With any new flexibility comes a corresponding larger responsibility. The prime responsibility must be to provide reliable and Ham Friendly satellite service. Then, through a broader base of satellite user support, AMSAT can afford to fund "...future-oriented technologies and operating modes..." But how are the satellite planners going to know what Ham Friendly satellite service means unless we help them define it? By 1995, is it going to be still just Mode B? We look forward to hearing from you. Send your comments to R. Myers Communications, P.O. Box 175, Litchfield, CT 06759, FAX to 203-283-0769, or CompuServe 70272,1002. ◆◆◆

OSCAR 10 is Running in Mode L!

This story appeared in *OSCAR Satellite Report* No. 224 dated June 15, 1991. It updates the current status of one of the older OSCARs and tells what to do if you hear it.

Bob McGwier, N4HY, has observed that the OSCAR 10 satellite is running in Mode L! Following this observation, AMSAT-DL reported that the IHU had randomly switched from Mode B to Mode L a few weeks ago. Since the high gain antennas are in use on Mode L, there is no chance to reset back to Mode B from the Northern Hemisphere due to antenna offpointing. The antennas are Earth pointing at the Southern Hemisphere during perigee and the command station, operated by Graham Ratcliff, VK5AGR, is trying to do the reset to Mode B. Unfortunately the Doppler shift is very large at perigee in Mode L and the nominal uplink frequency may have changed a bit. Graham's efforts to reset back to Mode B are probably also hampered by the very short window when the Mode L antennas are Earth pointing over VK land. By the time you read



K0RZ presented a review of Mode S operations aboard OSCAR 13 in *Satellite Operator* for May 1991. This photograph of his antennas was included along with photos of the Mode S hardware now flying aboard OSCAR 13.

this, reset may have taken place and the Mode B beacon may be back on. If you hear the Mode B beacon on OSCAR 10, please do not use the transponder until it has been released by the command stations. Early reports of the Mode B beacon returning to full strength may be sent to VK5AGR @ PACSAT 1 (that's OSCAR 16), @ UOSAT-3 (that's OSCAR 14), @ 8J1JBS (that's OSCAR 20), or @ VK5WI. *(Thanks Bob McGwier, N4HY, Peter Guelzow, DB2OS, and the ANS)* ◆◆◆

Some Recent DX on OSCAR 13 from KL7GRF/6

Every Issue of *OSCAR Satellite Report* keeps you up to date in the World of DX with information like this:

NEW/INTERESTING DX RECENTLY HEARD/WORKED

STATION	*SATELLITE*	*MODE*	*QSL INFO*
IW0UL/IS0	AO-13	B/SSB	Unknown
V73BQ	AO-13	B/SSB	Bureau
4U6ITU	AO-13	B/SSB	*Callbook* (4U1ITU)
HB0/DL6NDI/P	AO-13	B/SSB	Home Call
CT4KQ	AO-13	J/SSB	*Callbook*
EA9MH	AO-13	B/SSB/CW	Manuel Paez Perez Plaza Tarragona 9 Melilla, Spain or Box 364 Melilla, Spain
FK1TK	AO-13	B/SSB	Henri Rainier, Box 4608 Noumeau, New Caledonia
SV4ZJ	AO-13	J/SSB	*Callbook*
UM9MZC	AO-13	B/SSB	UM8MAA
HC5K	AO-13	B/SSB	KT1N
TR8CA	AO-13	B/SSB	W6BF
UM8TDE	AO-13	B/SSB	UM9TWA (1991 *Callbook*)
OY9JD	AO-13	B/SSB/CW	*Callbook*
J37BG	AO-13	B/SSB	*Callbook* (NOT VIA KL7GRF)
XE1DFN	AO-13	B/SSB	*Callbook*
FO5LQ	AO-13	B/SSB	*Callbook*
FP/VE1KM	AO-13	B/CW	R. G. Thompson C/O Air St. Pierre, Box 574 Enfield, Nova Scotia B0N 1N0 Canada
EA9MH	AO-13	B/CW	Manuel Paez Perez Plaza Tarragona 9 Melilla, Spain or Box 364 Melilla, Spain
TA1D	AO-13	B/SSB/CW	Kadri Mehmet Basak Box 1167 Sikeci TR-34437 Istanbul, Turkey
PY6ASV	AO-13	B/SSB	*Callbook*/Bureau
HL1EJ	AO-13	B/SSB/CW	*Callbook*/Bureau
GJ7DNI	AO-13	B/SSB	Box 338 St. Helier, Jersey U.K.
GJ0YNG/P	AO-13	B/SSB	Same as GJ7DNI
FR3EK	AO-13	B/SSB	*Callbook*
UM8TBE	AO-13	B/CW/SSB	UM9TWA
HC5K	AO-13	B/SSB	*Callbook*
6W1QB	AO-13	B/SSB	DB5PW
OK2ZZ	AO-13	B/SSB	*Callbook*/Bureau
EI5BYB	AO-13	B/SSB	*Callbook*/Bureau
EI9GO	AO-13	B/SSB	*Callbook*/Bureau
VS6BG	AO-13	B/SSB	Box 12727 Hong Kong
LX2LA	AO-13	B/SSB	*Callbook*/Bureau
A22BW	AO-13	B/SSB	DK3KD
HK3HEN	AO-13	B/SSB	*Callbook*/Bureau
9Q5EE	AO-13	B/SSB	K1RH
BV6JC	AO-13	B/SSB	Box 404, Tainan 60099 Taiwan
4U1ITU	AO-13	B/SSB	*Callbook*
7X2AJ	AO-13	B/SSB	Jaffar Amour 4 Rue De Linne, Algiers 16000

High-Tech High Efficiency NiMH Batteries and Solar Cells to be Used Aboard SEDSAT-1

In *OSR 223* we told you about a new battery technology that may soon replace NiCads. Nickel-metal-hydride (NiMH) batteries have 80-100% more electrical storage capacity by weight. These batteries have recently passed a testing milestone of 20,000 charge/discharge cycles at 30% depth of discharge. This could be a significant advantage for small satellites. A quantity of the new batteries is being obtained from Ovonic Battery Company of Troy (Detroit), Michigan for space qualification purposes by the builders of the SEDSAT-1 Amateur satellite.

The type of power system to be used on the satellite is a current regulated distributed power system, a prototype of which will be constructed at the Marshall Space Flight Center, Electronics Branch by NASA personnel, and University of Alabama Students for the Exploration and Development of Space (SEDS), which is an AMSAT-NA Member Society. The system voltage is tentatively set at 30 Volts. There will be 40 cells arranged as 2 batteries giving a system voltage of 30 Volts DC at a full charge of 100 amp/hours per battery.

The high efficiency (approximately 26%) AlGaAs/CIS tandem solar cells recently donated by Boeing Defense and Space Company, Renton, Washington for the SEDSAT-1 project coupled with these new NiMH batteries results in a rather robust power system for a small satellite. SEDSAT-1 is about 14" x 14" x 12" in exterior dimensions.

The volunteers of the new AMSAT-NA Spacecraft Lab in Detroit, with consultation and assistance from other AMSAT-NA engineers and technicians around North America, plan to construct the OSCAR communications package for the project. The current suite of equipment being designed is a high efficiency Mode A (2-meter uplink, 10-meter downlink) linear transponder for general Amateur Radio SSB/CW communications, and a Mode J (2-meter uplink, 70-cm downlink) PACSAT style digital transponder using standard AFSK FM packet radio for both the uplink and the downlink. With all the new high efficiency technology onboard, this bird should provide some fine contacts with relatively simple equipment and omnidirectional antennas! Satellite telemetry will be provided by two 9600 bps FSK 70 cm beacons. ◆◆◆

Short Bursts

News about the Amateur Radio Space Program

✺ The OSCAR 21 Mode B transponder #2 is still in use on several orbits but there is no schedule at the moment and the transponder may be off when you expect it to be on. AMSAT-U plans to switch back to Mode B transponder #1 including RUDAK. RUDAK has no link with transponder #2 so it is necessary to switch back to Mode B transponder #1 to test the receiver section for the self oscillation problem experienced earlier. *(Thanks Peter Guelzow, DB2OS)*

✺ Also on the subject of OSCAR 21, we should mention that using the linear transponder for SSB communications is a bit tricky — keeping the power level down far enough to be equal to the beacon is difficult. This bird is so sensitive that care must be taken not to overload the transponder.

✺ As we mentioned in past issues of *OSR* there is an AMSAT-NA Detroit Area Repeater (1270.05 MHz input, 1282.05 MHz output). If you're attending the AMSAT-NA Space Symposium on November 8-10 in the Los Angeles area, you may be interested to know there is a similarly affiliated repeater there too: KL7GRF/R (1271.65 MHz input, 1283.65 MHz output). Check it out while you're in the area.

✺ *OSR* is pleased and honored to announce that Ray Soifer, W2RS, author of "Ray's Corner" which regularly graces the pages of *OSR* with some of the finest writing and most thought provoking material in the Amateur satellite field, has been elected to the grade of Fellow by the Radio Club of America. Founded January 2, 1909, the Radio Club of America is the world's oldest radio communications society. Ray, who is also a long time AMSAT-NA member, was one of 30 members elected this year to this prestigious position. Our warmest congratulations Ray!

✺ The launch of UoSAT-F (to be designated OSCAR 22 once in orbit) is presently scheduled for mid-July. Among other capabilities, it will have an imaging experiment onboard similar to OSCAR 9, 11, and 18 (WEBERSAT). Listen for its downlink on 435.120 MHz 9600 bps FSK, with 1200 bps AFSK backup, using either 5 or 2 Watt power levels. Further details of this interesting mission will be published in *Satellite Operator*. Incidentally, the French SARA satellite, which has no connection with Amateur Radio, is on the same launch and will be transmitting on a downlink of 145.995 MHz! *(Received via OSCAR 11 by KD2BD. Thanks to Richard, G3RWL, for the report).* ♦♦♦

Satellite Keplerian Elements

June 28,1991

Satellite: AO-10
Catalog number: 14129
Epoch time: 91166.27097017
Element set: 677
Inclination: 25.8015 deg
RA of node: 140.4208 deg
Eccentricity: 0.6031965
Arg of perigee: 250.6223 deg
Mean anomaly: 37.6778 deg
Mean motion: 2.05879289 rev/day
Decay rate: 9.30e-07 rev/day^2
Epoch rev: 3220

Satellite: RS-10/11
Catalog number: 18129
Epoch time: 91167.76746148
Element set: 680
Inclination: 82.9272 deg
RA of node: 59.1712 deg
Eccentricity: 0.0011206
Arg of perigee: 180.7527 deg
Mean anomaly: 179.3612 deg
Mean motion: 13.72193611 rev/day
Decay rate: 1.49e-06 rev/day^2
Epoch rev: 19953

Satellite: UO-11
Catalog number: 14781
Epoch time: 91162.56401050
Element set: 27
Inclination: 97.8987 deg
RA of node: 207.6093 deg
Eccentricity: 0.0011810
Arg of perigee: 181.4371 deg
Mean anomaly: 178.6940 deg
Mean motion: 14.66998546 rev/day
Decay rate: 2.058e-05 rev/day^2
Epoch rev: 38862

Satellite: RS-12/13
Catalog number: 21089
Epoch time: 91160.92134196
Element set: 90
Inclination: 82.9231 deg
RA of node: 109.4949 deg
Eccentricity: 0.0028543
Arg of perigee: 302.9485 deg
Mean anomaly: 56.8925 deg
Mean motion: 13.73902856 rev/day
Decay rate: 1.32e-06 rev/day^2
Epoch rev: 1714

Satellite: AO-13
Catalog number: 19216
Epoch time: 91157.06388580
Element set: 274
Inclination: 56.7701 deg
RA of node: 90.7246 deg
Eccentricity: 0.7185846
Arg of perigee: 256.1839 deg
Mean anomaly: 21.0619 deg
Mean motion: 2.09696177 rev/day
Decay rate: 2.15e-06 rev/day^2
Epoch rev: 2282

Satellite: UO-14
Catalog number: 20437
Epoch time: 91164.72205928
Element set: 392
Inclination: 98.6657 deg
RA of node: 244.2007 deg
Eccentricity: 0.0010840
Arg of perigee: 173.5584 deg
Mean anomaly: 186.5759 deg
Mean motion: 14.29147398 rev/day
Decay rate: 6.22e-06 rev/day^2
Epoch rev: 7249

Satellite: AO-16
Catalog number: 20439
Epoch time: 91167.13761111
Element set: 291
Inclination: 98.6722 deg
RA of node: 246.9379 deg
Eccentricity: 0.0011475
Arg of perigee: 165.1835 deg
Mean anomaly: 194.9684 deg
Mean motion: 14.29236400 rev/day
Decay rate: 6.24e-06 rev/day^2
Epoch rev: 7284

Satellite: DO-17
Catalog number: 20440
Epoch time: 91166.48790560
Element set: 291
Inclination: 98.6729 deg
RA of node: 246.3399 deg
Eccentricity: 0.0011355
Arg of perigee: 167.3443 deg
Mean anomaly: 192.8027 deg
Mean motion: 14.29321992 rev/day
Decay rate: 6.83e-06 rev/day^2
Epoch rev: 7275

Satellite: WO-18
Catalog number: 20441
Epoch time: 91166.73802305
Element set: 287
Inclination: 98.6720 deg
RA of node: 246.6371 deg
Eccentricity: 0.0012121
Arg of perigee: 166.9654 deg
Mean anomaly: 193.1843 deg
Mean motion: 14.29364872 rev/day
Decay rate: 6.15e-06 rev/day^2
Epoch rev: 7279

Satellite: LO-19
Catalog number: 20442
Epoch time: 91163.98264138
Element set: 287
Inclination: 98.6719 deg
RA of node: 243.9531 deg
Eccentricity: 0.0012266
Arg of perigee: 174.4366 deg
Mean anomaly: 185.6971 deg
Mean motion: 14.29437232 rev/day
Decay rate: 5.80e-06 rev/day^2
Epoch rev: 7240

Satellite: FO-20
Catalog number: 20480
Epoch time: 91166.43188667
Element set: 236
Inclination: 99.0258 deg
RA of node: 148.9252 deg
Eccentricity: 0.0540562
Arg of perigee: 305.6254 deg
Mean anomaly: 49.5629 deg
Mean motion: 12.83204913 rev/day
Decay rate: 7.50e-07 rev/day^2
Epoch rev: 6333

Satellite: AO-21
Catalog number: 21087
Epoch time: 91160.67531591
Element set: 90
Inclination: 82.9412 deg
RA of node: 239.2764 deg
Eccentricity: 0.0034267
Arg of perigee: 281.6235 deg
Mean anomaly: 78.1080 deg
Mean motion: 13.74386502 rev/day
Decay rate: 1.20e-06 rev/day^2
Epoch rev: 1799

Satellite: NOAA-12
Catalog number: 21263
Epoch time: 91141.60510434
Element set: 16
Inclination: 98.7352 deg
RA of node: 171.2228 deg
Eccentricity: 0.0012119
Arg of perigee: 242.0629 deg
Mean anomaly: 117.9346 deg
Mean motion: 14.21385360 rev/day
Decay rate: 4.94e-06 rev/day^2
Epoch rev: 98

Satellite: FENGYUN
Catalog number: 20788
Epoch time: 91161.36512216
Element set: 196
Inclination: 98.9462 deg
RA of node: 195.0547 deg
Eccentricity: 0.0014383
Arg of perigee: 195.5712 deg
Mean anomaly: 164.5011 deg
Mean motion: 14.01162244 rev/day
Decay rate: 1.44e-06 rev/day^2
Epoch rev: 3925

Satellite: MIR
Catalog number: 16609
Epoch time: 91167.47205011
Element set: 538
Inclination: 51.6026 deg
RA of node: 290.8884 deg
Eccentricity: 0.0004225
Arg of perigee: 291.1734 deg
Mean anomaly: 68.9524 deg
Mean motion: 15.58561838 rev/day
Decay rate: 2.8532e-04 rev/day^2
Epoch rev: 30505

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